NASA/SP—1999-7011/SUPPL486
March 8, 1999

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Typical Report Citation and Abstract

1. 19970001126 NASA Langley Research Center, Hampton, VA USA
2. Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
3. Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA
4. Mar. 1996; 130p; In English
5. Contract(s)/Grant(s): RTOP 505-68-70-04
6. Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
7. To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 80°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
8. Author
9. *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 486)

MARCH 8, 1999

51
LIFE SCIENCES (GENERAL)

19990018607 NASA Ames Research Center, Moffett Field, CA USA

Role of Catecholamines in Thyroxine-Induced Changes in Metabolism and Body Temperature During Exercise in Dogs

Kaciuba-Uscilko, Hanna, Polish Academy of Sciences, Poland; Brzezinska, Zofia, Polish Academy of Sciences, Poland; Greenleaf, J. E., NASA Ames Research Center, USA; 1975, pp. 68-69; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Blockade of beta receptors inhibited thyroxine-induced increases in Tsub re) blood FFA and LA levels during exercise in dogs.

Derived from text

Thyroxine; Catecholamine; Metabolism; Body Temperature; Dogs

19990018876 Wisconsin Univ., Wisconsin Center for Space Automation and Robotics, Madison, WI USA

Experiment 8: Environmental Conditions in the ASTROCULTURE(trademark) Plant Chamber During the USML-2 Mission

Bula, R. J., Wisconsin Univ., USA; Zhou, Weijia, Wisconsin Univ., USA; Yetka, R. A., Wisconsin Univ., USA; Draeger, N. A., Wisconsin Univ., USA; Second USA Microgravity Laboratory: One Year Report; Aug. 1998; Volume 1, pp. 8.209-8.217; In English; Also announced as 19990018868; Original contains color illustrations

Contract(s)/Grant(s): NAGw-975; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Conducting plant research to assess the impact of microgravity on plant growth and development requires a plant chamber that has the capability to control other environmental parameters involved in plant growth and development. The environmental control in a space-based plant chamber must be equivalent to that available in such facilities used for terrestrial plant research. Additionally, plants are very sensitive to a number of atmospheric gaseous materials. Thus, the atmosphere of a plant chamber must be isolated from the space vehicle atmosphere, and the plant growth unit should have the capability to remove any such deleterious materials that may impact plant growth and development. The Wisconsin Center for Space Automation and Robotics (WCSAR), University of Wisconsin-Madison, has developed a totally enclosed controlled environment plant growth unit. The flight unit was used to support the ASTROCULTURE(TM) experiment conducted during the USML-2 mission. The experiment had two major objectives: 1) Provide further validation of the flight unit to control the experiment-defined environmental parameters in the plant chamber, and 2) support a plant experiment to assess the capability of potato plant material to produce tubers in microgravity. This paper describes the temperature, humidity, and carbon dioxide conditions of the plant chamber during the mission, from launch to landing. Another paper will present the plant response data.

Author

Vegetation Growth; Plants (Botany); Microgravity; Spaceborne Experiments; Controlled Atmospheres; Environmental Control; Chambers

19990018877 NASA Kennedy Space Center, Cocoa Beach, FL USA

Experiment 9: ASTROCULTURE: Growth and Starch Accumulation of Potato Tuber

Tibbitts, Theodore W., Wisconsin Univ., USA; Brown, Christopher S., Dynamac Corp., USA; Croxdale, Judith G., Wisconsin Univ., USA; Wheeler, Raymond M., NASA Kennedy Space Center, USA; Second USA Microgravity Laboratory: One Year Report; Aug. 1998; Volume 1, pp. 9.219-9.228; In English; Also announced as 19990018868; Original contains color illustrations

Contract(s)/Grant(s): NAS10-12180; NAGw-4022; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Potato explants (leaf, small stem section, and axillary bud) flown on STS-73 developed tubers of 1.5 cm diameter and 1.7 g mass during the 16-day period of space flight. The experiment was undertaken in the ASTROCULTURE(TM) experiment package under controlled temperature, humidity, lighting, and carbon dioxide concentrations. The tubers that formed in the explant system under microgravity had the same gross morphology, the same anatomical configuration of cells and tissues, and the same sizes, shapes, and surface character of starch granules as tubers formed in a 1 g environment. The total accumulation of starch and other energy containing compounds was similar in space flight and ground control tubers. Enzyme activity of starch synthase, starch phosphorylase, and total hydrolase was similar in space flight and ground controls, but activity of ADP-glucose pyrophosphorylase was reduced in the space flight tuber tissue. This experiment documented that potatoes will metabolize and accumulate starch as effectively in space flight as on the ground. Thus, this data provides the potential for effective utilization of potatoes in life support systems of space bases.

Author

Vegetation Growth; Potatoes; Starches; Microgravity; Enzyme Activity; Gravitational Effects; Spaceborne Experiments

19990018878 Colorado Univ., Center for Bioserve Technologies, Boulder, CO USA

Experiment 10: USML-2/STS-73 One Year Post-Flight Summary of the Commercial Generic Bioprocessing Apparatus (CGBA) Payload

Stodieck, Louis S., Colorado Univ., USA; Berryman, John, BioServe Space Technologies, USA; Wolfe, Rachelle, BioServe Space Technologies, USA; Second USA Microgravity Laboratory: One Year Report; Aug. 1998; Volume 1, pp. 10.229-10.259; In English. Also announced as 19990018868; No Copyright; Avail: CASI: A03, Hardcopy; A04, Microfiche

The primary mission of BioServe is to facilitate commercial use of the unique environment of space, primarily that of microgravity, in the field of life sciences. Space flight provides a unique test-bed for developing new technologies/products with ultimate terrestrial benefit. The space environment can be used to understand, accelerate, or retard biophysical/biochemical processes, to create new biological products or to improve existing ones, via process-oriented applied research. In other words, the investigations focus on how the space environment can be used as a commercially viable "tool" that will eventually provide a "value added" factor to a commercial product or process. BioServe focuses on research in three main project areas: 1) biomedical/pharmaceutical, 2) bioprocessing/biotechnology, and 3) agricultural/environmental. Previous space flight investigations sponsored by BioServe can be broadly categorized to include studies on small whole organisms/invertebrates, plants, microorganisms, mammalian cells, viruses, biomaterials, bones, crystal growth, human physiology, and other related topics. In general, reduced gravity, often referred to as weightlessness, and the space environment have been shown to alter one or more aspects associated with each of the above categories. Ongoing research is directed towards identifying the underlying causes of the altered outcomes and exploring the potential of related commercial applications. Support of commercial space life science research in the three designated project areas described above is provided through BioServe personnel's multidisciplinary space flight research experience, pay-load planning expertise, space flight operations management, and the capability to provide flight certified hardware. This provides a service for clients that otherwise could not feasibly perform space flight research. The process consists of the following fundamental steps: BioServe adopted the philosophy of using "generic" hardware designs to enable a wide variety of pilot studies to be accomplished in a common apparatus. This strategy allows a "next step" approach to be taken in the sense that specialized payloads can be consequently designed to further support promising initial findings. For example, seedling experiments which were initially performed in our test tube-like device, the Fluids Processing Apparatus (FPA) evolved into a full-scale Plant Growth Chamber (PGBA) that recently flew on STS-77 and is currently manifested on STS-83. Reasonable upgrades to Shuttle hardware capabilities can be implemented to reflect client needs, with special emphasis on changes that may enable more effective approaches to desired market segments when the International Space Station (ISS) becomes operational. BioServe has designed and flown a variety of hardware on numerous carriers including NASA's KC-135 parabolic aircraft, sounding rockets, the Space Shuttle and the Mir space station.

Author

Bioprocessing; Microgravity; Gravitational Effects; Spaceborne Experiments; Weightlessness; Space Shuttle Payloads; Space Transportation System Flights

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19990018432 Naval Postgraduate School, Monterey, CA USA
Female Health and Physical Fitness at the Naval Academy
Stamper, Trevis L.; Aug. 1998; 153p; In English
Report No(s): AD-A355982; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Stress related health disorders may be an indication that some female midshipmen at the Naval Academy are making exceptional efforts to meet specified physical performance standards. The stress at the service academies is much higher than in many civilian occupations and may increase the risk of females developing gender related health problems such as amenorrhea, bone loss, and eating disorders. The purpose of this research is to shed some light on ways in which gender related health problems can be decreased while improving the overall quality of midshipmen at the Naval Academy. First, a comparison of male versus female exercise patterns and performance is provided. In order to identify risk factors, hypotheses testing procedures are used to examine the relationship between female health disorders and selected explanatory variables. Recognizing risk factors early can also reduce the risk of gender related problems long after midshipmen have graduated. Lessening the amount of injuries now can prevent health problems that develop by middle age, and will also help reduce the cost of medical compensation later in an officer's life. DTIC

Females; Physical Fitness; Health; Stress (Physiology); Physiological Tests

19990018537 Naval Medical Research Inst., Wright-Patterson AFB, OH USA
Basic Concepts in Industrial Hygiene as Applied in the Chemical Propulsion Industry
Jederberg, Warren W., Pacific Fleet, USA; Still, K., Naval Medical Research Inst., USA; The 1998 JANNAF Propellant Development & Characterization Subcommittee and Safety & Environmental Protection Subcommittee Joint Meeting; Apr. 1998; Volume 1, pp. 449-457; In English; Also announced as 19990018506; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC; Hardcopy; Microfiche

The intent of this paper is to provide sufficient information to allow the reader to recognize the need for Industrial Hygiene and describe some of the approaches used in evaluating and controlling occupational hazards in the Chemical Propulsion Industry. The information provided should also guide the reader in referring to the supporting Industrial Hygiene activity in a way that will maximize the support and provide a springboard for dialogue in solving "real world" problems encountered in the chemical propulsion industry.
Author

Chemical Propulsion; Industrial Safety; Operational Hazards; Hygiene; Public Health

19990018539 Naval Medical Research Inst., Toxicology Detachment, Wright-Patterson AFB, OH USA
Concepts in Toxicology: Cardiac Sensitization
Smith, E. A., Naval Medical Research Inst., USA; Still, K. R., Naval Medical Research Inst., USA; The 1998 JANNAF Propellant Development & Characterization Subcommittee and Safety & Environmental Protection Subcommittee Joint Meeting; Apr. 1998; Volume 1, pp. 471-477; In English; Also announced as 19990018506; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC; Hardcopy; Microfiche

With the discovery that chlorofluorocarbons (CFCs) and halocarbons (Halons) deplete atmospheric ozone, several international agreements were drafted, starting in 1987 with the Montreal Protocol. The agreements mandated the replacement of these chemicals with more 'environmentally friendly' agents. CFCs and Halons are used primarily as refrigerants and fire suppressants. This has presented the Navy with the challenge of replacing these agents by or before the set international deadlines, while at the same time fulfilling it's national security obligations in maintaining fleet readiness. The Navy has in its fleet of ships one of the world's largest installed bases of CFC-12 air conditioning and refrigeration systems. Therefore, the search for an appropriate replacement agent is no small undertaking. Not only does the new agent have to meet specific engineering requirements, reducing the need for extensive modification to pre-existing equipment, but it must also meet certain toxicological standards, in order to comply with existing safety regulations. One of the many components in evaluating the toxicity of these replacement agents is cardiac sensitization. Cardiac Sensitization is defined as the hypersensitization of the heart to adrenaline (epinephrine) when an individual is exposed to an exogenous chemical. Hypersensitization is characterized by the development of arrhythmia and typically occurs during stressful or strenuous situations (i.e. fire or physical excursion). A chemicals' potential to produce cardiac sensitization is evaluated using the beagle dog model. The model operates by exposing the dog to increasing concentrations of the chemical until the onset of arrhythmia. When the animal model was developed, the observation of life-threatening arrhythmia

was the only known and acceptable endpoint (parameter) by which to measure cardiac sensitivity. However, recent advances in the various sciences and the view of the general public have rendered the model rather extreme and the endpoint (arrhythmia) controversial. The development of an in vitro (non-whole animal) test would be useful, both from a practical as well as a humane point of view. Even though several in vitro models have been attempted, it is still apparent that a better understanding of the mechanism that produces cardiac sensitization is needed. Developing an in vitro cardiac sensitization test would provide the Department of Defense with a means to quantitatively evaluate chemicals for cardiac effects. Therefore, the aim of this research is to isolate the physiological threshold response that drives the heart toward arrhythmia. This response may be a mechanical, biochemical or electrophysiological process. Mechanical, biochemical and electrophysiological parameters will be evaluated prior to the development of near-fatal arrhythmia. The anticipated result is the identification of a parameter or series of parameters that will accurately predict potential cardiac sensitizers (chemicals) before life-threatening electrophysiological and hemodynamic changes occur.

Author

Electrophysiology; Hemodynamic Responses; Heart; Arrhythmia; Cardiology; Physiological Effects; Toxicology

19990018540 Geo-Centers, Inc., Wright-Patterson AFB, OH USA

Acute Lung Injury, the Acute Respiratory Distress Syndrome, and Inhalation Injury

Kimmel, Edgar C., Geo-Centers, Inc., USA; Still, Kenneth R., Naval Medical Research Inst., USA; The 1998 JANNAF Propellant Development & Characterization Subcommittee and Safety & Environmental Protection Subcommittee Joint Meeting; Apr. 1998; Volume 1, pp. 479-496; In English; Also announced as 19990018506; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC; Hardcopy, Microfiche

A brief overview of fundamental aspects of the continuum of diseases from Acute Lung Injury (ALI) to the more severe form Acute Respiratory Distress Syndrome (ARDS) is given. The review is not technologically comprehensive and is intended as an introductory primer for Naval operational personnel interested in health risks associated primarily with inhalation of smoke. Although there are numerous and varied causes of ARDS, the focus of this synopsis is on inhalation injury. In particular, the risk of ALI/ARDS from inhalation of combustion products from materials of military interest.

Author

Lungs; Injuries; Respiration; Respiratory System; Respiratory Diseases; Industrial Safety; Exhaust Gases

19990018574 Joint Publications Research Service, Arlington, VA USA

Sopite Syndrome in Operational Flight Training

Flaherty, David E.; Sep. 1998; 88p; In English

Report No.(s): AD-A354942; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Sopite Syndrome is a poorly understood response to motion characterized by drowsiness, fatigue, sleep disturbances, and mood changes. It is distinct from "regular" motion sickness or common fatigue, and may affect the performance of motor vehicle as well as aircraft operators. The potential impact Sopite Syndrome may have on military aviation is relatively unknown. Recently, research in situations relevant to aviation training and flight operations has been initiated. The present study is part of that effort. Its goal is to determine the incidence, severity, and association of Sopite Syndrome characteristics in a population of Student Naval Flight Officers (SNFOs). Seventy-eight SNFOs assigned to Training Squadrons Four and Ten located at the Naval Air Station Pensacola, Florida completed a questionnaire designed to capture evidence/incidence of fatigue, motion sickness, drowsiness, and sleep disturbances during days when SNFOs flew versus non-flying days. The questionnaire data was coded/tabulated for entry on a spreadsheet for subsequent analysis. Descriptive and non-parametric statistical techniques were used to analyze the data set obtained. The results show sufficient evidence between the levels of symptomology and their relationships when comparing conditions that support the existence of Sopite Syndrome in operational flight training.

DTIC

Flight Training; Motion Sickness; Signs and Symptoms; Aircraft Pilots; Symptomology

19990018830 Iowa Univ., Iowa City, IA USA

Use of Biomarkers to Optimize Heat Acclimation in Women *Final Report, 25 Sep. 1995 - 24 Sep. 1998*

Gisolfi, Carl V.; Oct. 1998; 44p; In English

Contract(s)/Grant(s): DAMD17-95-C-5093

Report No.(s): AD-A357253; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

These were designed to determine: (a) if short-term estradiol supplementation (ES) improves heat dissipation and if HSP70 can serve as a biomarker to assess this improvement; and (b) if ES for 7 days of heat exposure enhances the process of heat acclimation (HA). We also determined if HSP70 measurements could predict the rate of HA. Results showed that ES in premenopausal

women during the follicular phase of the menstrual cycle: (a) did not enhance sweating, cutaneous blood flow, or the time required to achieve HA. Moreover, neither ES nor HA alone induced the synthesis of HSP70. These studies were designed to determine if ES would enhance exercise performance in the heat and what combination of ES and exercise training would enhance the acclimation of female ovariectomized rats to the heat. These studies showed that: (a) ES had no effect on heat transfer to the skin or heat dissipation by evaporative cooling, but that ES increased thermotolerance in ovariectomized rats exercising at high ambient temperatures; and (b) the combination of exertional heat exposure and ES, when compared to ES alone, enhances thermotolerance in rats exercising at a high ambient temperature.

DTIC

Blood Circulation; Menstruation; Exposure; Temperature Effects; Acclimatization; Evaporative Cooling

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19990018044 Santa Clara Univ., CA USA

MRM Evaluation Research Program

Taylor, James C., Santa Clara Univ., USA; Nov. 30, 1998; 116p; In English

Contract(s)/Grant(s): NCC2-1025; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This is an interim report on the current output of the MRM evaluation research program. During 1998 this research program has used new and existing data to create an important tool for the development and improvement of "maintenance resource management" (MRM). Thousands of surveys completed by participants in airline MRM training and/or behavior change programs have, for the first time, been consolidated into a panel of "MRM Attitudes and Opinion Profiles." These profiles can be used to compare the attitudes about decision making and communication in any given company at any stage in its MRM program with attitudes of a large sample of like employees during a similar period in their MRM involvement. This panel of comparison profiles for attitudes and opinions is a tool to help audit the effectiveness of a maintenance human factors program. The profile panel is the first of several tools envisioned for applying the information accumulating in MRM databases produced as one of the program's long range objectives.

Derived from text

Resources Management; Decision Making; Human Factors Engineering; Research Projects

19990018049 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany

Image Data Fusion for Enhanced Situation Awareness

Doehler, H.-U., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Hecker, P., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Rodloff, R., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Nov. 1998; 12p; In English; Also announced as 19990018045; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Today's aircraft crews have to handle more and more complex situations. Especially during approach, landing, take-off, and taxiing the improvement of situational awareness can be regarded as a key task. Particularly future military transport aircrafts have to cope with new requirements such as autonomous, non-cooperative landing at unsupported (without D-GPS, MLS, ILS) airstrips down to CAT-I (minimum) or better, low level flight operations, ground mapping, precise air dropping, search and rescue missions. In most cases these requirements have to be established under adverse weather conditions, without being detected by hostile observation. Within this context visual information provided by fusion of image data from onboard multispectral sensors with synthetic vision (SV), supported by an ATC - interface and aircraft state data (position, attitude and speed), will become an important and helpful tool for aircraft guidance. The development of these so called "Enhanced Vision Systems" (EVS) is an interdisciplinary task, which requires a wide spectrum of different information technologies: (1) modern data link technology for transmission of guidance information; (2) complex data bases to provide terrain data for synthetic images and to support the imaging sensors (sensor characteristics, object signatures); (3) high performance computer graphics systems to render synthetic images in real time; (4) a new generation of onboard imaging sensors, like solid state infrared and especially a new kind of imaging radar, providing a real view through darkness and adverse weather; and (5) knowledge based image interpreters to convert sensor images into a symbolic description. This paper presents the DLR concept for an integrated enhanced vision system. After the description of the basics in section 2 the image sensor characteristics are compared with the requirements of an Enhanced-Vision-System in

section 3. First results concerning the experiments with the DASA HiVision radar and data fusion techniques are given in section 4.2 and 4.3.
Derived from text
Enhanced Vision; Multisensor Fusion; Fuzzy Systems; Imaging Radar; Radar Data; Real Time Operation; Visual Perception; Pilot Performance; Workloads (Psychophysiology); Human Factors Engineering

19990018361 Armstrong Lab., DOD Medical Support, Brooks AFB, TX USA
The Effects of Stress on Individual and Group Problem Solving
Callister, J. D., Armstrong Lab., USA; Retzlaff, P. D., University of Northern Colorado, USA; Percival, G. L., Air Force Survival School, USA; King, R. E., Air Force Research Lab., USA; Dec. 1998; 4p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The USA Air Force (USAF) Survival, Evasion Resistance and Escape (SERE) training offers an ideal setting for studying the effects of realistic stress on individual and group problem solving. In the past, the effect of stress on individual and team performance have been observed and modified to enhance training. Currently, the effects of stress are being studied by collecting objective data, and systematically controlling program modifications to enable data-based decisions. Initial data suggest that cognitive performance, including problem solving and associative learning declines during training. Student's self-report of fatigue and competence to perform necessary individual and group skills also changed considerably during training.
Author
Mental Performance; Human Performance; Problem Solving; Survival; Workloads (Psychophysiology)

19990018362 Georgia Univ., Dept. of Psychology, Athens, GA USA
The Effects of Sleeploss, Continuous Performance and Feedback on Hierarchical Team Decision Making
Mahan, Robert P., Georgia Univ., USA; Elliott, Linda R., Air Force Research Lab., USA; Dunwoody, Philip T., Georgia Univ., USA; Marino, Christopher J., Georgia Univ., USA; Dec. 1998; 8p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Advances in the performance of command and control activities in global and tactical military operations will need to address the issues associated with the interaction of team level decision variables with operational readiness constructs. For example, team decision making is currently a significant area of research and training, yet very little applied significance has been attached to the effects of operational factors such as sleeploss and continuous performance on team-level constructs. This study explores the effects of sleep loss, continuous performance, and the presence and absence of task performance feedback on team decision making. The study demonstrates that these operational variables are associated with significant performance decrements at a number of levels associated with team hierarchical decision making model. The implications of these performance decrements for complex team performance are briefly discussed.
Author
Sleep; Teams; Losses; Human Performance; Decision Making

19990018370 Abertay Univ., Div. of Psychology, Dundee, UK
Training Group Performance for Biasing and Debiasing Decision Making Which Avoids Groupthink
Cook, Malcolm, Abertay Univ., UK; Elder, Leona, Abertay Univ., UK; Ward, George, ESE Associates, UK; Dec. 1998; 12p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Research on biases in thinking and judgement are frequently related to the strategic use of limited information processing resources by human operators. Human operators have been shown to have a limited capacity short-term memory and to experience problems in retrieving information quickly from long-term memory. The limited information processing capability of the human operator is supposed to encourage the use of heuristics and biases which reduce memory requirements of processing (Huey and Wickens, 1993). Application of this model to decision making by operators in complex systems suggests that external cognitive support and effective information presentation are appropriate responses to increase the probability of correct decisions. In this paper it is argued that the reluctance to shift out of skill-based processing encourages the maintenance of biases in thinking. It is suggested that awareness of their own biases and of the periods in which they are likely to occur may render decision makers more effective. In addition, it suggests a new style of pilot's assistant technology which actively encourages the exchange of information between on-board systems and the operator. This participative dialogue management will help to ensure that inconsistencies between information and action are addressed before an ineffective mental model activated and applied to key decisions.
Author
Decision Making; Group Dynamics; Heuristic Methods; Management Information Systems; Cognition; Information Processing (Biology); Complex Systems

19990018420 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Recommendation to Implement GYRO-IPT for Disorientation Training at CFSAT
Cheung, Robert; Wong, Wayne T.; Aug. 1998; 12p; In English
Report No.(s): AD-A356535; 98-TM-59; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the acquisition of the GYRO IPT (ETC) at the Canadian Forces School of Aeromedical Training (CFSAT), an evaluation was completed to determine the usefulness of this device and how it might be implemented into existing undergraduate pilot training syllabus. The GYRO IPT is the most recent version of the GYRO-1 series of flight simulators. It features upgrades on the pitch and roll motion capability and options for data acquisition and medical monitoring. The major advantage of the device is its interactive closed-loop (pilot-in-the-loop) feature that forces the trainee to relate any demonstration to actual flight situations. In summary, the motion capability of the GYRO-IPT is able to elicit the type of vestibular illusions that are related to the inadequacy of the semicircular canals system (incapable of detecting constant velocity motion). However, due to the limited pitch (+/- 15 degrees) and roll (+/- 30 degrees) capability and the lack of planetary rotation, disorientation illusions that can be demonstrated by the GYRO IPT are limited to the type of vestibular illusions that are related to the inadequacy of the semicircular canals system. For example, Coriolis cross-coupling and somatogyral illusions are very convincing. The device also reasonably demonstrates most of the visual illusion profiles such as autokinesis, black hole approach, false horizon, runway width and up-sloped runway. We find that the listing of nystagmus as an illusion is erroneous. Nystagmus is not an illusion but a physiological response to the sustained angular acceleration and deceleration acting on the semicircular canals. Due to the lack of positive G forces greater than one (which normally accompany the graveyard spin and graveyard spiral illusions in the aircraft) it is recommended that graveyard spin/spiral be replaced by a spin demonstration only.
DTIC
Flight Training; Physiological Effects; Aerospace Medicine; Physiological Responses; Feedback Control

19990018576 Harvard Univ., Cambridge, MA USA
Early Scene Analysis: Rapid Processing of Contours Surfaces, and Objects in Human Vision (AASERT)
Cavanagh, Patrick; Jan. 1998; 4p; In English
Contract(s)/Grant(s): Proj-34841
Report No.(s): AD-A356058; AFOSR-94-0376; AFRL-SR-BL-TR-98-0710; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report covers the AASERT grant which is a companion grant to AFOSR 94-0189 of the same title. Over the duration of the grant, support and training were provided for 5 different graduate students and 7 undergraduates. The work concentrated on how 2-D information is built up from the parallel analysis of a set of visual attributes and how this information contacts memory in order to construct 3-D representations of the visual scene. We were specifically interested in the early stages of these processes which may operate under simplified assumptions in order to gain speed. We examined the rapid decomposition of image values into object features (reflectance, transparency, orientation, 3D position) and illumination features (shadows, shading, highlights). We also evaluated the nature of the representation achieved at these early levels and whether the output of each of the many early stages is independently available to higher level processes or only one final "result" gets passed along. Finally, we studied the initial contact between the image contours and memory in recognition.
DTIC
Image Processing; Computer Vision; Contours; Scene Analysis

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19990017870 Department of the Navy, Washington, DC USA
Workplace Layout Method Using Convex Polygon Envelope
O'Brien, Francis J., Jr, Inventor; May 26, 1998; 7p; In English; Supersedes US-Patent-Appl-SN-7080008
Patent Info.: Filed 27 Aug. 1996; US-Patent-Appl-SN-708-008; US-Patent-5,757,675
Report No.(s): AD-D019104; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An improved method for laying out a workspace using the prior art crowding index PDI, where the average interpoint distance between the personnel and/or equipment to be laid out, dbar iact can be determined. The improvement lies in using the convex hull area, Apoly, of the distribution of points being laid out within the workplace space to calculate the actual crowding index for

the workspace. The convex hull area is that area having a boundary line connecting pairs of points being laid out such that no line connecting any pair of points crosses the boundary line. Pick's theorem with additional methods using the Surveyor's Area formula and Hero's formula also being described for calculating Apoly. The improved crowding index is termed PDIpoly to distinguish it from the prior art crowding index, PDIacr.
DTIC
Boundaries; Spatial Distribution; Mathematical Models; Hulls (Structures)

19990017891 Research and Technology Organization, Neuilly-sur-Seine, France
Alternative Control Technologies: Human Factors Issues
Oct. 1998; 114p; In English
Report No.(s): AD-A355911; RTO-EN-3; AC/323(HFM)TP/1; RTO-LS-215; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

With the increasing intelligence of computer systems, it is becoming more desirable to have an operator communicate with machines rather than simply operate them. In combat aircraft, this need to communicate is made quite crucial due to high temporal pressure and workload during critical phases of the flight (ingress, engagement, deployment of self-defense). The HOTAS concept, with manual controls fitted on the stick and throttle, has been widely used in modern fighters such as F16, F18, EFA and Rafale. This concept allows pilots to input real time commands to the aircraft system. However, it increases the complexity of the pilot task due to inflation of real time controls, with some controls being multifunction. It is therefore desirable, in the framework of "ecological interfaces", to introduce alternative input channels in order to reduce the complexity of manual control in the HOTAS concept and allow more direct and natural access to the aircraft systems. Control and display technologies are the critical enablers for these advanced interfaces. There are a variety of novel alternative control technologies that when integrated usefully with critical mission tasks can make natural use of the innate potential of human sensory and motor systems. Careful design and integration of candidate control technologies will result in human-machine interfaces which are natural, easier to learn, easier to use, and less prone to error. Significant progress is being made on using signals from the brain, muscles, voice, lip, head position, eye position and gestures for the control of computers and other devices. Judicious application of alternative control technologies has the potential to increase the bandwidth of operator-system interaction, improve the effectiveness of military systems, and realize cost savings. Alternative controls can reduce workload and improve efficiency within the cockpit, directly supporting the warfighter.
DTIC
Human Factors Engineering; Man Machine Systems; Artificial Intelligence; Human-Computer Interface

19990018062 Universitaet der Bundeswehr Muenchen, Neubiberg, Germany
The Cognitive Assistant System and its Contribution to Effective Man/Machine Interaction
Flemisch, Frank Ole, Universitaet der Bundeswehr Muenchen, Germany; Onken, Reiner, Universitaet der Bundeswehr Muenchen, Germany; Nov. 1998; 12p; In English; Also announced as 19990018045; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

New information technology and highly integrated mission systems offer a high degree of information availability and powertul machine capabilities. This can be of great benefit, but might also lead to new problems due to bottlenecks in human information processing, especially in situations with high workload and tough time constraints. This paper describes a possible solution to cope with this problem: Cognitive Assistant Systems. CAMA, the Crew Assistant Military Aircraft, is a prototype Cognitive Assistant System for the domain of military transport aircraft. It is under development at the University of Armed Forces Munich in cooperation with DASA, ESG and DLR. Recently it had been tested in a flight simulator with German Airforce pilots and will be tested inflight in early 2000. Starting with some basic considerations about man machine interaction, this paper describes the structure of CAMA, its functions, with emphasis on its interface philosophy. As an outlook caSBAro, an integrated human factors environment for online recording, visualisation, analysis and replay of operator and assistant system behaviour with respect to the underlying situation will be described.
Author
Man Machine Systems; Information Systems; Flight Crews; Human Factors Engineering; Human-Computer Interface; Information Processing (Biology); Cognition; Pilot Support Systems

19990018148 Department of the Navy, Washington, DC USA
Breathing Gas Temperature Modification Device
Hughes, Robert J., Inventor; Price, Kenneth, Inventor; McCrory, Dennis, Inventor; Courson, Billy, Inventor; Rudolph, Joseph, Inventor; Jun. 09, 1998; 7p; In English
Patent Info.: Filed 16 Dec. 1996; US-Patent-Appl-SN-767,507; US-Patent-5,761,909
Report No.(s): AD-D019111; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A device is provide for modifying the temperature of a breathing or other gas supplied through a conduit. A heat exchanger is mounted in-line with the conduit. A thermoelectric device has first and second thermally conductive plates separated by at least one thermoelectric couple. The first thermally conductive plate is in thermal contact with the heat exchanger. A phase change material is in thermal contact with the second thermally conductive plate. A voltage is applied to the thermoelectric couple(s) to maintain the first and second thermally conductive plates at different temperatures. The phase change material changes from a first phase to a second phase at a phase change temperature that is selected to be between the different temperatures of the first and second thermally conductive plates.
DTIC
Phase Transformations; Heat Exchangers; Thermoelectricity; Breathing Apparatus; Gas Mixtures

19990018334 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France
Collaborative Crew Performance in Complex Operational Systems *L'Efficacite du Travail en Equipage dans des Systemes Operationnels Complexes*
Collaborative Crew Performance in Complex Operational Systems; Dec. 1998; 390p; In English, 20-22 Apr. 1998, Edinburgh, UK; Also announced as 19990018335 through 19990018371; Original contains color illustrations
Report No.(s): RTO-MP-4; AC/323(HFM)TP/2; ISBN 92-837-1008-8; Copyright Waived; Avail: CASI; A17, Hardcopy; A04, Microfiche

Research and applications in human factors has frequently only considered individual operator interfaces, for limited work domains in well-defined scenarios, as evaluated by unitary measures. As we progress towards the next millennium, complex operations will increasingly require consideration and integration of the collaborative element wherein crew performance becomes a critical factor for success. The goal of this symposium has been to bring together a global perspective on issues and factors that need to be understood when systems design is focused on the crew operating in a complex environment. Hence, the papers contained in these proceedings give the reader a broad, multidisciplinary view of needs, requirements, ongoing research and development projects, and various research agendas that will bring about new technologies, approaches, and measures with regard to collaborative crew performance. The papers and multiple perspectives contained in these proceedings provide a baseline for understanding many elements of crew performance and in that sense will be valuable for the human factors specialist that must now design for the collaborative element and be concerned with the broad bandwidth of complexities within the operational setting. Additionally, the volume provides information for researchers, scientists, and engineers in many different areas who find themselves immersed in collaborative systems design.
Author (revised)
Human Factors Engineering; Man Machine Systems; Group Dynamics; Decision Making; Task Complexity

19990018335 Naval Air Warfare Center, Training Systems Div., Orlando, FL USA
Tactical Decision Making Under Stress (TADMUS): Mapping a Program of Research to a Real World Incident: The USS Vincennes
Johnston, Joan H., Naval Air Warfare Center, USA; Cannon-Bowers, Janis A., Naval Air Warfare Center, USA; Salas, Eduardo, Naval Air Warfare Center, USA; Collaborative Crew Performance in Complex Operational Systems; Dec. 1998; 4p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Incidents as the one involving the USS Vincennes, where the decision to initiate countermeasures was the incorrect one, have focused attention on the human factor in decision making. The objective of the TADMUS program has been to apply developments in decision theory, individual and team training, and information display to the problem of enhancing tactical decision quality under condition of stress. Sponsored by the Office of Naval Research, TADMUS is in its 8th year as a cooperative program in human factors and training involving SPAWAR Systems Centers, San Diego, NAWCTSD, as well as other Navy, industrial, and academic organizations. The technology is being demonstrated and evaluated in the context of surface ship air warfare scenarios. This address will describe how the TADMUS program was founded and how it has progressed on a variety of R&D issues having to do with advanced training and human factors in order to address real world problems.
Author
Human Factors Engineering; Decision Theory; Decision Making; Information Systems

19990018336 Defence and Civil Inst. of Environmental Medicine, Toronto, Ontario Canada

An Exploratory Application of Ecological Interface Design to Aircraft Systems

Beevis, D., Defence and Civil Inst. of Environmental Medicine, Canada; Vicente, K., Toronto Univ., Canada; Dinadis, N., Toronto Univ., Canada; Dec. 1998; 10p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Ecological interface design (EID) is a theoretical framework for designing Operator-Machine Interfaces (OMIs) that tries to integrate different kinds of representations into a common interface based on two concepts from cognitive engineering: (1) the abstraction hierarchy; and (2) the skills, rules, and knowledge framework. The abstraction hierarchy is a multilevel knowledge structure that can be used to develop physical and and functional models of systems as well as the mappings between them. The skills, rules, knowledge framework provides principles for information to support those three levels of behaviour. to date, most applications of EID have been to process control. In order to explore the applicability of EID to aircraft systems and to build on previous work, an exploratory application was made to the systems of the CC-130 Hercules aircraft which are controlled by the Flight Engineer (FE). The project included: (1) in-flight familiarization; (2) a protocol analysis of FE tasks; (3) preparation of an abstraction hierarchy of the CC-130 systems; (4) definition of the interface content and structure; and (5) representation of the information in visual form. The outcome was a rapid prototype of an 'EID interface' for the CC-130 engineering systems that was evaluated by a focus group of Canadian Forces Flight Engineers. The study concluded that: (1) the principles of EID can be applied to aircraft systems; (2) EID needs to be supplemented by more specific design principles; and (3) EID can be integrated with such principles. Operator response to the prototype showed that the design of the OMI for one operator needs to take into account the responsibilities and functions of other crew members.

Derived from text

Design Analysis; Flight Control; Protocol (Computers); Interfaces; Aircraft Design

19990018337 British Aerospace Defence Ltd., Military Aircraft and Aerostructures, Farnborough, UK

Collaborative Crew Issues in a Future Reconnaissance Land Vehicle

Thody, M., British Aerospace Defence Ltd., UK; Ross, I. F., British Aerospace Defence Ltd., UK; Dec. 1998; 6p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

TRACER/FSCS is an international collaborative program to develop an armored reconnaissance land system for the British and US Military and is set to enter the project definition phase from which a design solution will be proposed. The vehicle will small and stealthy, designed to carry out surveillance and intelligence acquisition on tomorrow's battlefield, and be equipped with state-of-the-art sensors, communications, battlefield information, and weapon systems. The TRACER/FSCS crew, of three soldiers, will be required to execute a complex and demanding role through the effective and efficient operation of these complex systems. Overall system performance will necessitate an effective collaborative team performance from three individual soldiers forming an integrated crew. The TRACER/FSCS program provides a considerable HFI challenge and numerous questions have been addressed during development. This paper highlights seven key areas for discussion and details the subsequent conclusion.

Author

Information Systems; Human Performance; Complex Systems; Human Factors Engineering; Human Behavior

19990018338 Maryland Univ., School of Medicine, Baltimore, MD USA

Collaboration in Complex Medical Systems

Xiao, Yan, Maryland Univ., USA; Mankenzie, Colin F., Maryland Univ., USA; Dec. 1998; 10p; In English; Also announced as 19990018334

Contract(s)/Grant(s): NCC2-921; N00014-91-J-1540; DAAL01-96-C-0091; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Improving our understanding of collaborative work in complex environments has the potential for developing effective supporting technologies, personnel training paradigms, and design principles for multi-crew workplaces. USing a sophisticated audio-video-data acquisition system and a corresponding analysis system, the researchers at University of Maryland have been able to study in detail team performance during real trauma patient resuscitation. The first study reported here was on coordination mechanisms and on characteristics of coordination breakdowns. One of the key findings was that implicit communications were an important coordination mechanism (e.g. through the use of shared workspace and event space). The second study was on the sources of uncertainty during resuscitation. Although incoming trauma patients' status is inherently uncertain, the findings suggest that much of the uncertainty felt by care providers was related to communication and coordination. These two studies demon-

strate the value of and need for creating a real-life laboratory for studying team performance with the use of comprehensive and integrated data acquisition and analysis tools.
Author
Complex Systems; Medical Equipment; Human Performance; Teams; Human Factors Engineering; Workloads (Psychophysiology)

19990018339 Forschungsinstitut fuer Hochfrequenzphysik, Ergonomics and Information Systems, Werthhoven, Germany
Crew Concept WS-TORNADO: Navy (GE)
Schweingruber, Joerg, Forschungsinstitut fuer Hochfrequenzphysik, Germany; Dec. 1998; 6p; In English; Also announced as 19990018334; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The TORNADO aircraft weapon system that went into service with the German Navy in the middle of 1982 was based on the operational requirements and technical standards of the 70's. Changes in the operational goals forced requirements for improving, conserving and adjusting performance capabilities and made various equipments necessary being added to the current system. During the realization of these modifications, the ergonomic aspects of the TORONADO's man-machine interface, i.e., the cockpit, was largely neglected. An analysis and evaluation of man-machine interactions in the cockpit was carried out, including analysis of tasks, loads and demands on crew members and man-machine task allocation, depending on various typical navy missions and mission phases. In addition, extensive workload experiments were conducted with simulator and real flights representative for navy missions. Demands on subjects in simulator flights were analysed with questionnaires and the relative workload measurement method SWORD, and in real flights with questionnaires and the absolute subjective workload measurement method ZEIS.
Derived from text
Crews; Workloads (Psychophysiology); Man Machine Systems; Weapon Systems

19990018340 Georgetown Univ., Neuropsychology Div., Washington, DC USA
Team Compatibility as a Predictor of Team Performance: Picking the Best Team
Kay, Gary G., Georgetown Univ., USA; Dolgin, D. L., Naval Air Warfare Center, USA; Dec. 1998; 8p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Collaborative crew systems are likely to be influenced by the interpersonal relationship that exist between crew members. Although, individual members of crews are often highly screened and selected for their cognitive capacity, intelligence, conscientiousness, and emotional stability, little attention is generally paid to the interpersonal needs of team members or to the overall compatibility of the team. Schutz postulated that a group with higher compatibility will have higher goal achievement than a group with lower compatibility. The present study investigated the utility of a self report personality test (the FIRO-B) as a measure of team compatibility. The teams participating in the the study were 3-man groups of U.S. Air Force AWACS Weapons Directors engaged in high fidelity simulation of combat conditions. Results of the study generally did not support the hypothesis that high compatibility, as measured by the FIRO-B, would be associated with better simulated AWACS performance. Nevertheless, crew compatibility appears to have been a factor in team performance for several of the teams. The article stresses the need for developing effective measures of team compatibility.
Author
Human Performance; Emotional Factors; Crews; Compatibility; Teams; Personality Tests

19990018341 British Aerospace Defence Ltd., Military aircraft and Aerostructures, Warton, UK
Multi-Crew Workload Issues Onboard the Nimrod MR2 and Nimrod MRA4
Felstead, Alan, British Aerospace Defence Ltd., UK; Dec. 1998; 10p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The Nimrod aircraft is an excellent example of how multi-crew collaboration in a complex operational system ensures the successful prosecution of a maritime patrol mission. The paper provides an overview of the roles of the Nimrod aircrew and examines how the complexity of aircrew interaction makes it difficult to measure crew workload and demonstrate that it is within an acceptable limit. The importance of ensuring that the aircrew workload is within an acceptable limit is also discussed.
Author
Workloads (Psychophysiology); Complex Systems; Human Factors Engineering; Human Performance; Mental Performance

19990018342 British Aerospace Public Ltd. Co., Sowerby Research Centre, Filton, UK
Multi-Crew Workload Measurement for Nimrod MRA4
Harmer, Steven, British Aerospace Public Ltd. Co., UK; Dec. 1998; 6p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

British Aerospace as Prime Contractor for the UK's Replacement Maritime Patrol Aircraft, the Nimrod MRA4, due to enter service at the beginning of the next century, is required to demonstrate that the crew workload levels associated with operating the aircraft do not exceed acceptable levels. In order to do this BAe must be able to define this acceptance level and provide a meaningful mechanism for measuring workload in a multi-crew environment, where environment, where task allocation is highly dynamic and team working is essential. This paper describes the techniques, the method proposed for comparing between two different crew compositions and the issues associated with deriving crew workload acceptance criteria.
Author
Workloads (Psychophysiology); Crews; Reconnaissance Aircraft

19990018343 Air Force Research Lab., Collaborative Systems Technology Branch, Wright-Patterson AFB, OH USA
Assessing Operators' Potential for Collaboration in Complex Systems
King, R. E., Air Force Research Lab., USA; Callister, J. D., Armstrong Lab., USA; Retzlaff, P. D., University of Northern Colorado, USA; Dec. 1998; 4p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The operators of the future will face an ever-changing enemy. As nation-states and political systems rise and fall so will the nature of warfare and war machines. The cognitive abilities and personality make-up of combatants may need to change with both the enemy and technology. Pilotless aircraft and advanced spacecraft lend unique challenges to the psyche of the operator, as does rapid change from localized flare-ups to global nuclear threats. Experts in psychological research will be tasked to help aviators and policy makers keep the operator up with the rapid changes. As we invest increasingly large amounts of money into each individual airframe and mission, we must learn more about the human operator, whether that individual is a pilot or an operator in a virtual reality environment. ALAPS may aid selection of tomorrow's aviators, as it is an aviation-specific personality inventory. We plan to establish real-world, criterion validity by correlating findings on the ALAPS to behavioral measures, such as simulator flights, peer evaluations, and flight performance reports on mission-tested aviators.
Derived from text
Mental Performance; Virtual Reality; Pilotless Aircraft; Flight Characteristics; Complex Systems; Aircraft Pilots

19990018344 Naval Undersea Warfare Center, Newport, RI USA
Evaluating Concepts of Operation for Team/System Collaboration
Kirschenbaum, Susan S., Naval Undersea Warfare Center, USA; Collaborative Crew Performance in Complex Operational Systems; Dec. 1998; 10p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

New systems demand new ways of working, both for the systems and for the users. This paper describes a methodology for evaluating the effectiveness and usability of complex, interconnected, collaborating systems. The methodology combines Exploratory Sequential Data Analysis, or ESDA, with a high fidelity fully crewed multiple scenario "Concept of Operation Exercise" that we at the Naval Undersea Warfare Center Division Newport call COOPEX. This paper describes the combination of ESDA and COOPEX methodologies in general and then reports on the results of one case study, the 1995 C3I COOPEX for the New Attack Submarine.
Author
Complex Systems; Sequential Analysis; Teams; Human Performance

19990018345 Naval Air Warfare Center, Training Systems Div., Orlando, FL USA.
A Methodology for Measuring Team Situational Awareness: Situational Awareness Linked Indicators Adapted to Novel Tasks (SALIANT)
Muniz, Elizabeth J., Naval Air Warfare Center, USA; Stout, Renee J., Naval Air Warfare Center, USA; Bowers, Clint A., Naval Air Warfare Center, USA; Salas, Eduardo, Naval Air Warfare Center, USA; Dec. 1998; 8p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Situational awareness has been recognized to be crucial for ensuring the effectiveness of teams performing in dynamic and complex environments. Given its criticality, researchers have called for reliable and valid measures of situational awareness that can be used as a basis for designing training. However, most of the available measurement techniques have been criticized as being insufficient for assessing situational awareness. Further, there is a dearth of research being conducted to measure team level situational awareness even though much of situational awareness is needed in team settings. Therefore, in this paper we describe a methodology for assessing team situation awareness. This methodology contains theoretically-based behavioral indicators of

team events. This methodology, termed Situational Awareness Linked Indicators Adapted to Novel Tasks (SALIANT), results in a behavioral checklist that can used to behaviorally assess situational awareness in teams.
Author
Teams; Group Dynamics; Human Behavior; Groups

19990018346 University of Central Florida, Orlando, FL USA
Empirical Validation of the SALIANT Methodology
Bowers, C., University of Central Florida, USA; Weaver, J., University of Central Florida, USA; Barnett, J., University of Central Florida, USA; Stout, Renee J., Naval Air Warfare Center, USA; Dec. 1998; 6p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Past research has indicated the importance of considering the situation awareness (SA) construct as it might apply to team performance. This report attempts to contribute to our understanding of this research area, through the development of a measure of team situation awareness. The method for the development and preliminary validation of the measure is described herein (i.e., SALIANT; Situation Awareness Linked Instance Adapted to Novel Task). The methodology was developed to be one that would be appropriate for variety of team applications. However, this report describes our preliminary validation of the measure with aircrews. Specifically, the effort sought to assess whether the measure would demonstrate expected associations with performance indices and to compare its utility to an existing SA methodology (i.e., SAGAT). The report describes our findings regarding the effectiveness and benefits of the measure as well as providing recommendations and caution for its future use.
Author
Human Performance; Teams; Workloads (Psychophysiology); Mental Performance; Groups

19990018347 Institute of Aviation Medicine, Prague, Czechoslovakia
Physiological Parameters as a Possible Information About Collaboration Between Two Crew of the Commercial Aircraft During Long Haul Flights
Truska, Oldrich, Institute of Aviation Medicine, Czechoslovakia; Sulc, Jiri, Institute of Aviation Medicine, Czechoslovakia; Dec. 1998; 8p; In English; Also announced as 19990018334; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

By comparison of psycho-physiological response of a crew, consisting of two unequally experienced pilots it followed that the individuals with lesser amount of total and type specific flying hours than their counterparts are exposed to higher workload, regardless of their actual position within the crew. The cardiovascular response to the medium- and long-haul flights was more intense in flight officers than in commanders. The same difference appeared in subjective feeling of fatigue.
Author
Workloads (Psychophysiology); Physiological Responses; Commercial Aircraft; Cardiovascular System; Human Performance

19990018348 Linkoeping Univ., Graduate School of Human-Machine Interaction, Sweden
Measurements and Models, Models and Measurements: You Can't Have One Without the Other
Hollnagel, Erik, Linkoeping Univ., Sweden; Dec. 1998; 8p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The paper discusses the relation between measurements and models. Two conditions are identified: one where measuremnets refer to articalated models, and one where measurements refer to folk models. It is argued that measurements should refer to the peformance characteristics of the joint system, rather than of assumed cognitive functions. Futhermore, that it is not meaningful to describe described independently of the context. A proposed measure relates to the orderliness of performance, i.e., the level of control that the joint system has over the situation. The possible details of thos measure are outlined.
Author
Measurement; Mathematical Models

19990018349 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA
Cognitive Engineering: The Latest Fad or a True Step Forward as an Approach to Complex Multi-Person System Analysis and Design?
Eggleston, Robert G., Air Force Research Lab., USA; Dec. 1998; 12p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Cognitive Engineering is a theoretically based design framework and an engineering practice whose aim is to produce robust, cooperative systems that aid human performance. It is particularly relevant for the design of complex adaptive systems to be used in high demand work situations. High-demand work is a common characteristic of military operations. Cognitive Engineering

is an example of a user-centered design approach to the development human-machine systems for use in such environments. This framework considers design issues that emerge from an analysis of individual task work, team work, and collaborative work in the course of solving work problems to accomplish system goals.
Derived from text
Man Machine Systems; Military Operations; Human Performance; Human Factors Engineering

19990018350 Air Force Research Lab., Collaborative Systems Technology Branch, Wright-Patterson AFB, OH USA
Identifying the Social and Cognitive Requirements of Teamwork Using Collaborative Task Analysis
McNeese, M. D., Air Force Research Lab., USA, Dec. 1998; 8p; In English. Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Typically, collaborative systems design only considers the technological imperative while ignoring the social, cognitive, and contextual components of teamwork. This paper describes a basis for addressing the social and cognitive requirements of design, given a situated problem context, through the use of collaborative task analysis. Inherent in the approach taken is the goal of eliciting, assessing, and measuring team schema that influences team performance in complex operational systems. Several real world and operational examples are described to highlight these aspects of teamwork.
Author
Human Performance; Complex Systems; Group Dynamics; Workloads (Psychophysiology)

19990018351 Purdue Univ., South Bend, IN USA
Using Fuzzy Cognitive Maps to Assess Multi-Operator Situation Awareness
Pernsich, Karl, Purdue Univ., USA, Dec. 1998; 12p; In English. Also announced as 19990018334; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

A key of modern battlefield environments is the rapid generation and enormous volume of data available to decision makers. Although this data can potentially afford a decision maker an accurate "snap shot" of the emerging situation, it can also produce noise and data clutter that confuses or distracts. When the resulting operation requires individual members of a distributed team to independently make the correct, or, at a minimum, the same interpretation of the available data, volume can become a key impediment to achieving team situation awareness. The problems for decision making become even worse when the team members are not co-located and the responsibilities are distributed. to mitigate adverse effects and to coordinate decision making activities requires tools for developing shared situation awareness within the team. In this paper, the use of fuzzy cognitive maps to model the battlespace for developing shared situation awareness within a team will be discussed.
Author
Decision Making; Decision Support Systems; Problem Solving

19990018352 Institut de Medicine Aerospatiale Armee, Dept. de Sciences Cognitives, Bretigny sur Orge, France
Dysfunction Analysis: A Specification Method for Collective Work Situations?
Hourlier, S., Institut de Medicine Aerospatiale Armee, France, Dec. 1998; 4p; In English. Also announced as 19990018334; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The growing part of work situations where crews have to deal with complex dynamic situations justify the need for specifically developed assistance. The design of these systems relies on the supply of proper requirements to designers. An original method, relying on the analysis of an operator activity marker derived from breakdowns and referred to as "Dysfunctions" has been developed, to assess its relevance in fulfilling the designer need, a study was conducted with data collected in the Operational Center of designers in charge of developing of a new Computerized Command System so as to evaluate its usability.
Author
Work Functions; Workloads (Psychophysiology); Mental Performance; Human Performance; Human Behavior

19990018353 Abertay Univ., Div. of Psychology, Dundee, UK
Communication Requirements in the Cockpit
Cook, Malcolm J., Abertay Univ., UK; Elder, L., Abertay Univ., UK; Ward, George, ESE Associates, UK, Dec. 1998; 12p; In English. Also announced as 19990018334; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper presents evidence in support of the view that communication requires careful assessment, and the introduction of new technologies must be carefully assessed to address the changes they may produce in communication patterns. One of the reasons why communication is more likely to be subject to changes in systems in multi-crew multi-platform or multi-crew single platform systems is the role of sensitivity of collaborative systems to disf-engagement. In simple terms it has been recognized that

collaborative applications and systems require multiple users if they are going to be successful. If users feel that the communication tasks interfere with other functions or are difficult to use then multi-user systems will fail.
Derived from text
Cockpits; Communication; Human Performance; Workloads (Psychophysiology)

19990018354 Stress Research Center, Prague, Czechoslovakia
Practical Results of the Verification of the Model of a Multioperator System
Sykora, J., Stress Research Center, Czechoslovakia; Bahlouh, R., Stress Research Center, Czechoslovakia; Oadova, J., Stress Research Center, Czechoslovakia; Dvoonk, J., Stress Research Center, Czechoslovakia; Podivinsky, I., Stress Research Center, Czechoslovakia; Chamrad, P., Stress Research Center, Czechoslovakia; Dec. 1998; 8p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The Stress Research Center is a specialized laboratory aimed at analyses of individuals and small groups of humans under stress, mainly under conditions of external situations in the Czech Army Ground Forces an in the Czech Air Force. The results presented here are based on experiments performed in the past ten years. The understandin_ of human/human and human/system interface issues team communication, aided by a suitable model, could increase the reliability of the crew and multicrew system operations. As yet, this was rather difficult on account of insufficient possibility of quantification of the relations of subject, members of the system. A quantified, dynamic model of psycho-social, intra- and intergroup relations was realized by methods of dynamic sociometry, based on fuzzy set and image theory, developed by Bahlouh in our Laboratory. The model was verified in practice in the E.S.A HUBES-94 experiment and in the Czech Air Force.
Author
Set Theory; Fuzzy Sets; Dynamic Models

19990018356 Defence Evaluation Research Agency, Centre for Human Sciences, Farnborough, UK
The Human-Electronic Crew: Human-Computer Collaborative Teamworking
Taylor, R. M., Defence Evaluation Research Agency, UK; Reising, J., Air Force Research Lab., USA; Dec. 1998; 18p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Advances in artificial intelligence will enable future military aircraft to have a rather unique crew - one human and electronic. It has proved useful to consider the required relationship as a Human-Electronic Crew team, involving collaborative, co-operative working between the human and the machine. This team is led by the pilot, with the Electronic Crewmember as a subordinate associate or assistant sharing responsibility, authority and autonomy over many cockpit tasks. As aircraft systems become more complex, the automation that the aircraft pilot has to interact with is becoming increasingly intelligent and capable. The pilot needs to remain in control of the system in uncertain situations with unpredictable demands, and yet make full use of the aiding that is provided, while being flexible and adaptive. The requirements for useful, intelligent aiding, in a highly dynamic task environment has led to impressive technical achievements. These include methods for in-flight situation assessment and replanning, cognitive modelling, human intent inferencing and error recognition, and the use of complex knowledge engineering and reasoning logic processes. Providing an appropriate architecture for complex system functioning, where the pilot can trust the Electronic Crewmember with autonomous aiding, but that keeps the pilot in control, presents a continuing engineering challenge.
Author
Human-Computer Interface; Knowledge Representation; Expert Systems; Crews; Aircraft Pilots; Artificial Intelligence

19990018360 Linkoeping Inst. of Tech., Centre for Human Factors in Aviation, Linkoeping, Sweden
Collaborative Failure in Distributed Crew Systems
Dekker, S. W. A., Linkoeping Inst. of Tech., Sweden; Fairburn, C., Linkoeping Inst. of Tech., Sweden; Dec. 1998; 8p; In English; Also announced as 19990018334; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

This article describes the anatomy of collaborative failure in distributed crew systems. In a number of incidents and accidents across a variety of application domains, we have recognized situations that evolve towards failure only through a series of interactions between critical decision-makers and their wider operational environment. Various military operating systems show a growing reliance on distributed decision making through multi-agent communication and coordination. This means that mis-coordination can translate smoothly into breakdowns in the entire system. Redundancy in the form of cross-checking and soliciting information from other system participants can produce a side-effect: if a system's success is distributed, so may its failure. In this paper we attempt to analyze some of the factors behind collaborative success and failure in distributed systems.
Author
Failure; Decision Making; Contract Management; Management Methods

19990018419 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Results of Continued Freefall Helmet Impact Studies
Adam, J.; Sep. 1998; 38p; In English
Report No.(s): AD-A356533; DCIEM-98-TM-55; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new sample foam insert for the Protec helmet was impact tested along with a standard insert to determine differences in impact protection. This testing was performed to ascertain the suitability of the new protective insert in the role of freefall parachute helmet. The testing showed that the performance of the new insert was better than the standard insert, but did not meet the standards set prior to testing.
DTIC
Impact Tests; Helmets; Protection

19990018429 Kopin Corp., Taunton, MA USA
Development of Support Technology for Color AMEL and AMLCD Head-Mounted Displays *Final Report, Jan. 1994 - Jul. 1996*
Woodward, Ollie C.; Kopin Corp., USA; Nov. 1998; 74p; In English
Contract(s)/Grant(s): DAAK60-94-C-0016
Report No.(s): AD-A356448; USASSC-NATICK/TR-99/005; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Enabling technologies were developed for manufacturing 2000 lines per inch, flat panel displays. These critically needed technologies are: (1) Primary Color Tri-Band Lamps for AMLCD back lighting to provide good color and brightness with a 3x power reduction. Lamps were shipped and evaluated. (2) Narrow liquid crystal (LC) gap assembly techniques required for a 12 microns pixel pitch. Assembly process is in production. (3) The 24 microns pixel display design was shrunk to allow manufacture of 12 microns pixel displays in preparation for the 2560 x 2048 displays. Shrunk 1280 x 1024, 12 microns pixel AMLCD displays were demonstrated. (4) A color filter process was developed and integrated into the display fabrication process.
DTIC
Color; Helmet Mounted Displays; Head-Up Displays

19990018435 Wyoming Univ., Laramie, WY USA
Shelf-Life and Safety Enhancement of Processed Meat by Hydrostatic Pressure in Combination with Moderate Temperature and Biopreservatives, Phase 4 *Final Report, Oct. 1996 - Sep. 1997*
Kalchayanand, Norasak; Ray, Bibek; Sikes, Anthony; Dunne, C. P.; Sep. 1998; 37p; In English
Contract(s)/Grant(s): DAAK60-93-K-0003
Report No.(s): AD-A356482; NATICK-TR-98/027; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effectiveness of a moderate hydrostatic pressure in combination with moderate temperature and biopreservatives to reduce high populations of pathogenic and spoilage bacteria in processed meat products was determined. Roast beef and fermented summer sausage were inoculated with 10(3) to 10(4) cells/g of four pathogens and four spoilage bacteria along with pediocin AcH or one of two bacteriocin-based biopreservatives. After vacuum-packaging, the bags were pretempered in a water bath to 50 C and then pressurized at 50,000 psi for 5 min at 50 C. The products were then stored at 25 C and examined at selected intervals for the presence and numbers of pathogenic and spoilage bacteria during storage up to 12 weeks. The results showed the complete kill of the spoilage and pathogenic bacteria in roast beef as no growth was observed after 12 weeks at 25 C in these samples. Pressurization of processed meat products at 50,000 psi for 5 min at 50 C indicates safety and long shelf-life even during extended storage at abusive temperatures.
DTIC
Hydrostatic Pressure; Food Processing; Preserving

19990018860 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Results of continued Freefall Helmet Impact Studies
Adam, J.; Apr. 06, 1998; 34p; In English
Report No.(s): AD-A356685; 98-TM-55; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new sample foam insert for the Protec helmet was impact tested along with a standard insert to determine differences in impact protection. This testing was performed to ascertain the suitability of the new protective insert in the role of freefall parachute helmet. The testing showed that the performance of the new insert was better than the standard insert, but did not meet the standards set prior to testing. 1. There is a continuing requirement for a protective helmet for Freefall Parachuting within the Canadian Forces. The impact protection of candidate helmets to be used in the freefall parachute role has been identified as a major concern. As such, the Defence and Civil Institute of Environmental Medicine (DCIEM) was tasked by Director Land Require-

ments (DLR) to perform impact testing on a new foam liner insert for the candidate helmet (Protec). This testing was to be performed as a continuation of the previous work (Ref A). 2. The aim of this project was to measure and analyse the impact performance of a new foam insert for the Protec helmet. Comparison to the original foam insert was to be made, along with performance relative to the standards described below.
DTIC
Impact Tests; Parachutes; Protection; Helmets

19990018866 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Automated Anthropometric Measuring Devices for Use in Mass-Screening *Final Report*
Moroney, William F.; Jan. 28, 1998; 41p; In English
Contract(s)/Grant(s): SPO900-94-D-0001
Report No.(s): AD-A356431; CSERIAC-RA-98-002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this report was to determine the state of the art in anthropometric measuring devices used for mass screening. In addition, technologies which could be used for mass screening were identified and described. Finally, straw-man requirements for an anthropometric measuring system were proposed. A review of the literature identified only two operational anthropometric measurement devices currently used for mass screening. One was developed for the US Navy by Provost, Gifford and Thazo (1965). The other, Anthropometric Measurement System (AMS) was developed by Ergotech, a firm in Pretoria, South Africa, to "facilitate the efficient issuing of clothing items to defense force personnel." A prototype of an improved system, Automated Anthropometric Data Measurement System (AADMS) was developed by Moroney, Hughes & Spicuzza (1984), but was never used operationally. A variety of potentially applicable measurement techniques were identified and described. Acoustic, light, electro-magnetic, and digitizing arm technologies could be used to measure individuals. Data describing the capabilities and limitations of these systems are also provided. Finally a series of requirements to be included in a straw-man requirements document was provided.
DTIC
Measuring Instruments; Anthropometry; Prototypes; Data Systems

19990019054 Armstrong Lab., Human Resources Directorate, Brooks AFB, TX USA
Mental Models as Finite-State Machines: Examples and Computational Methods *Interim Report, Mar. - Jun. 1997*
Ippel, Martin J.; Beem, A. Leo; Oct. 1998; 34p; In English
Contract(s)/Grant(s): Proj-2313
Report No.(s): AD-A357588; AL-HR-TR-1997-0179; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The term mental model often refers to an internal representation that can be mentally run to produce inferences, explanations, and predictions about the environment. Holland, Holyoak, Nisbett, and Thagard (1986) propose a formalism to capture the dynamics of mental models: a transition function defined on a set of model states, the result of a categorizing of environmental states. This transition function mimics the state changes that unfold in the environment. The paper shows that the addition of a few reasonable constraints to this formalism results in a class of transition functions with well known properties; the general class of finite state machines. Finite state machines can be used to model interactions between humans and artifices (e.g., an application program, an ATM, or a car). We present a method to test a hypothesis involving the partitioning of a set of environment states into equivalence classes, which are identified as states of the model. The method is demonstrated on a spatial reasoning task performed by second and third grade children.
DTIC
Human Factors Engineering; Equivalence; Human-Computer Interface; Mental Performance

Subject Term Index

Personal Author Index

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	March 8, 1999	Special Publication

4. TITLE AND SUBTITLE
Aerospace Medicine and Biology
A Continuing Bibliography (Supplement 486)

5. FUNDING NUMBERS

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
NASA Scientific and Technical Information Program Office

8. PERFORMING ORGANIZATION REPORT NUMBER
NASA/SP-1999-7011/Suppl486

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
National Aeronautics and Space Administration
Langley Research Center
Hampton, VA 23681

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Subject Category: Distribution:
Availability: NASA CASI (301) 621-0390

12b. DISTRIBUTION CODE
Unclassified--Unlimited
Subject Category - 52

13. ABSTRACT *(Maximum 200 words)*
This report lists reports, articles and other documents recently announced in the NASA STI Database.

14. SUBJECT TERMS
Aerospace Medicine
Bibliographies
Biological Effects

15. NUMBER OF PAGES
36

16. PRICE CODE
A03/HC

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified		

END